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THE EVOLUTION OF THE SENSES.

BY DR. OSKAR NAGEL,

New York City.

In a previous article[1] I have made a few remarks on the development of the color sense, which was gradually formed from the ability of distinguishing light and dark, just as the latter was developed from a most primitive sense for temperature and radiant energy. The field of reaction of the eye upon radiant energy was and is continuously increasing, and the exactness of this sense is constantly improved. Our citrafunctions were ultrafunctions for our ancestors, and our ultrafunctions will be citrafunctions for future generations. The thresholds of sensibility are constantly being decreased, the thresholds of differences lowered. Our adaptation to the outside energies acting upon us is somewhat like a reaction going on towards an equilibrium, without ever reaching the latter. The ability of evolution of the protoplasm results in evolution only by reason of the outside energies. If we would be perfectly adapted to these energies, if the reaction between the latter and our organism would be completed, our evolution would stop, notwithstanding the tendency of evolution in the organism. Our individuality would cease, we would be all alike, we would act alike and think alike. We would be so accustomed to our surroundings, that the accumulation of new experiences would stop, and our mental life would be reduced to instincts and reflex movements. By reason of the insensitiveness towards irritations, organic life would cease. Life is only possible by the presence of adaptability and the simultaneous action of uncompensated outside energies.

From this point of view the necessity of evolution can be concluded from Carnot's principle: in the presence of differences of in-

[1] PSYCHOL. REVIEW, July, 1908.

tensities (of energies), something will happen. As long as light is radiated by the sun, preventing a state of equilibrium, the motion, in the widest sense of the word, will not stop. Carnot is the founder of the exact theory of evolution.

A similar evolution as has been shown with the optic sense, can be observed with the auditory sense. In low animals the auditory organ is but a little bladder filled with otoliths, which serves only as a sense for progressive motion and not for hearing.[1] In the course of evolution 1, 2, 3 canales circulares are developed, while the otolithic organ is getting more and more complicated. The investigations of Mach, Breuer and other scientists make it very probable that the canales circulares are the sensitive organs for the sensation of angular acceleration. Finally from one part of the otolithic organ (lagena), the cochlea is developed, especially in the higher vertebræ, as organ for the sensation of noise and then of sound. We see that the functions of the organs are undergoing quite a change during the evolution. From a sense for temperature there is developed a sense for color, from a sense for motion a sense for sound. And as the eye gets adapted to a wider and wider field of colors, so the ear to a wider field of sounds.

The gradual increase of the capacity of the central sense, the brain, is easily observed.[2] The lower animals are restricted to reflex actions, they are nearly entirely unable to accumulate individual experiences, as experiments with snails, spiders and moths have shown. Some fishes show a much higher intelligence, while the birds have already a comparatively considerable memory. The higher mammalia have a good mechanical memory and can undoubtedly distinguish between identical and different phenomena. But only man acquires the faculty of forming and connecting long series of ideas.

The evolution of the senses is the basis of human history. The development of the fine arts depends mainly and hence keeps pace with the evolution of our optic sense, our perspective- and color-faculty. The development of music is a consequence of the evolution of the auditory sense. The evolution of the faculty of forming longer and longer series of ideas is described in the history of the sciences. The development of the senses shapes the arts, the sciences, the technical progress and the social conditions.

[1] Mach, *Pop.-wiss. Vorl.*, 3. Aufl., p. 400.

[2] Mach, *Pop.-wiss. Vorl.*, 'Zufällige Umstände bei Erfindungen.'

GENETIC LOGIC AND THEORY OF REALITY ('REAL LOGIC').[1]

BY J. MARK BALDWIN,

Professor in the Johns Hopkins University.

The paper of which this is an abstract, after stating the problem and method of Genetic Logic — as developed in the writer's work of that title cited below[2] — shows:

1. That Genetic Logic *lays the basis for Epistemology* (the theory of the objective reference of knowledge), and —

2. That such an Epistemology, in turn, is the foundation of a *positive doctrine of the meaning of Reality*. This latter problem — that of the meaning of Reality, as indicated by Genetic Logic — I call *Real Logic*.

These two positions are taken up in turn and the following conclusions reached:

I. *Genetic Logic and Epistemology.*

1. Genetic considerations — as worked out in the writer's *Thought and Things or Genetic Logic*,[3] especially Vol. ii., Part iv. — establish certain 'dualisms and limitations of thought.' Thought is found to be a function of dualism in the sense that it *mediates facts or truths through ideas*. By this mediation ideas or representations of all kinds are redistributed to the spheres in which their direct experience occurred. They are thus placed under either an external or an internal *control*, under which they are found to be 'true.' In this respect, then, thought is 'mediate': it mediates a more direct experience and refers to a dual control which is in this sense 'remote.' This

[1] Abstract of paper prepared for the Inter. Congress of Philosophy, Heidelberg, September, 1908.

[2] Genetic Logic applies to knowledge the method of genetic or developmental science which treats development as a progression through *essentially new stages or modes* (cf. the writer's work, *Development and Evolution*, 1902, Chap. XIX.; also M. Bergson's treatment in the same sense in his important work, *Évolution créatrice*, 1907).

[3] London, Sonnenschein; New York, Macmillans, i., 1906, ii., 1908; German trans. issued by Barth, Leipzig, vol. i., 1908, vol. ii. in preparation; French trans., Paris, Doin, vol. i., 1908, vol. ii. in preparation.

This paper presents some of the conclusions of vol. iii., not yet published.

dualism thought as such *cannot escape nor overcome. Thought issues in an epistemological dualism.*

2. Thought has limitations in respect to its scope. There are certain experiences whose essential meaning for consciousness cannot be rendered through the mediation which is characteristic of thought, since they escape the grasp of generalization and judgment by which thought proceeds. Such experiences are: the 'singular' in certain of its forms (*e. g.*, that which is made singular by the operation of a private and exclusive interest); the 'subject-self' presupposed in all acts of thought; and the assumptive or imaginative suggestion (or 'schema') when it is still personal to the individual's psychic life. Immediate *worth* experiences, also, lose their directness and full meaning when rendered descriptively in judgment. We conclude, therefore, that thought is limited in its rendering of experience, and that there must be a resort to some other function if the types of meaning mentioned above are to be given epistemological value. Or more positively — the meaning of whatever there is beyond the psychic life itself, is not exhausted by thought; the *alogical* meanings must also have their place in the theory of what is real.[1]

3. In general, then, we may say that thought and practice are only modes in which the 'real' is relatively apprehended. Besides these two, there are other modes of 'realizing' which have their own claim to recognition in the epistemological interpretation of experience as a whole. The further problem, therefore, that of *Real Logic*, is the problem of finding that experience in which the several modes of 'finding-real' are all included and intrinsically satisfied.

II. *Real Logic.*

The problem thus raised requires, first, a criticism and interpretation of each of the modes of 'realizing' or 'finding-real' similar to that given above to thought. We apprehend reality *perceptually*, we realize it *emotionally*, we postulate it *ethically* and *religiously*, we live it *mystically*, we contemplate it *æsthetically* — all these must have the same thorough criticism and estimation that we accord to the true and the useful, which are the rationalist's and voluntarist's special modes. And the problem of Real Logic becomes that of finding the 'logic' of the adjustments of these modes of the real, each having

[1] By a similar method it is also shown that the resort to *practice* (as in Instrumentalism and Pragmatism) also issues in an insurmountable dualism — that between *facts and ends*. 'Reality' is not exhausted in that which is found practically satisfying.

its own place and meaning, in the final 'real' significance of experience. As Epistemology — that is a theory of the objective reference of knowledge — has *its* logic in the machinery of discursive thinking, and Worth-theory has its logic in the adjustment of means to ends, so each of the other modes of finding the real has a 'logic' of *its* operation in the economy of experience as a whole.

This study has led the writer to certain conclusions in accordance with which he finds the unifying mode of experience to be in its type that of *æsthetic contemplation.* He has presented in a preliminary way certain of the grounds for this conclusion, as well as certain implications of it, in an article entitled 'Knowledge and Imagination' in the PSYCHOLOGICAL REVIEW, May, 1908 (especially pp. 189 ff.) from which the following quotations are made (somewhat modified): "In the æsthetic construction we find a mode of imaginative cognition which is motived not by the interest of extending knowledge nor by that of seeking satisfactions or working practical effects. It is a way of treating a content which we may properly describe as both *over-logical* and *over-practical.* The interest involved is intrinsic, as opposed to the theoretical and also to the practical." . . . "The outcome of my investigation is that in the æsthetic mode of experience, so defined, we have the only inkling of the way that the self-reality of inner control, which is the postulate of the voluntary and worthful, and the thing-reality of external control, which is the postulate of knowledge and truth, can in the process of experience come together, after having fallen apart in the development of cognition." . . . "The protest of the æsthetic imagination is always against partiality as among the modes of 'real' meaning. Its own ideal, on the contrary, is one of completeness, of reunion; it gives the 'real' which is absolute in the sense that its object is not relative to — and does not fulfill — one type of interest *only.*" . . . "If we use the word 'contemplative' to describe the cognitive aspect of the æsthetic consciousness, it should be given this full meaning. The self 'contemplates' a content when it reads it as *ideally truthful and so real for knowledge*, and also as, in its own mode and meaning, *ideally worthful and so real for will*, and in this union of controls, the earlier mediation of 'remote' realities gives place to the *immediateness of the real in feeling.*" . . . "The object of contemplative interest is thus not only an object, but an object that embodies and completes the self. The self is realized in it, and the experience becomes one that may be called absolute in certain well defined senses" (explained in the article from which this is quoted). . . . "Allowing each mode of psychic function its chance

to make out what 'real' it can in its own way, we find that the æsthetic mode of realizing gets the only meaning that can be called in any intelligible sense absolute. The word 'realize' as popularly used indeed suggests a more adequate experience than that of the 'finding real' of logical proof or the 'assuming real' of practical life."[1]

[1] It may be remarked that Plato's theory of Ideas is a 'real logic' in this sense, inasmuch as he attempts a 'comparative morphology' of ideas or meanings with reference to ultimate reality. Ideas are real, things are mere semblance (shadows, σκίαι). In an important sense, also, he finds the approach to the most real in the æsthetic experience.

The article referred to (PSYCHOLOGICAL REVIEW, May, 1908) summarizes certain of the principal positions of volumes I. and II. of my work, and shows the connection between the earlier stages of imaginative cognition (in which the quasi-æsthetic or 'semblant' type of immediacy appears) and the æsthetic proper.

PSYCHOLOGICAL LITERATURE.

JUDD'S PSYCHOLOGY.

Laboratory Manual of Psychology. CHARLES HUBBARD JUDD, Professor of Psychology and Director of the Psychological Laboratory at Yale University. New York, Scribner, 1907. Pp. 124.

Laboratory Equipment for Psychological Experiments. C. H. JUDD. New York, 1907. Pp. 252.

These constitute volumes two and three of 'a series of text-books designed to introduce the student to the methods and principles of scientific psychology.' Volume one has been reviewed in this BULLETIN, April 15, 1908.

Volume two contains directions to students for the performance of twenty-five typical exercises in experimental psychology. Volume three, which is virtually an instructor's manual, contains an account of the apparatus which may be employed for this purpose, and a list of demonstrations to accompany volume one. The two laboratory volumes have been purposely dissociated because the same exercise may be conducted with a variety of apparatus, and the selection of this apparatus is left, in the main, to the instructor.

The general plan for the use of the course is as follows: the exercises are undertaken only after an introductory course in psychology, and are executed preferably by the group method, *i. e.*, small classes or sections of large classes work, usually in pairs, upon the same problem at the same time, and meet subsequently for the comparison and discussion of their results. Each exercise is designed to occupy one laboratory period of two to two and a half hours. The student finds in his manual a brief statement of the purpose of the exercise, and a very general account of the conditions under which the observation is to be made. The instructor supplies the needed materials and explains the use of the apparatus. After the exercise is concluded, the student attempts to answer a number of questions found in his manual. He may also undertake related problems which are sketched for each topic, and may seek further enlightenment on the problem by use of the one or two reading references which conclude the exercise.

The twenty-five exercises fall roughly into four groups — ten exercises upon sensation and perception, of which the first five deal with

vision, seven exercises upon movement and action, one of which is devoted merely to the acquisition of technique, three exercises upon practise, distraction and fatigue, and five exercises upon the 'higher' mental processes, such as memory, attention, esthetics, etc. In contrast with most laboratory manuals, the first exercise is a *quantitative* study of visual *perception* — the Müller-Lyer illusion: this exercise is put first because it is judged to be typical of laboratory psychology, to be well adapted to quantitative work, and to be productive of closely similar results for all observers. The remainder of the exercises upon vision deal with indirect color vision, after-images, color mixture, the monocular estimation of size and distance (accommodation), and binocular space perception (double images, stereoscopy, fusion and rivalry). There follow two exercises in audition (binaural localization, fusion, pitch discrimination, 'interval sense'), two exercises with cutaneous stimulation (punctiform stimulation, localization, and esthesiometry), and an examination of sensation intensities (Weber's law and the limen for auditory acuity) during which the student is introduced to the more familiar psychophysical methods.

The second group of experiments begins with the technique of the graphic method, and then treats of the alteration of circulation and of muscular tonicity and coördination under various conditions. Attention is given chiefly to pulse, respiration, tremor, the planchette, strength of grip, tapping, line-drawing, simple and complex reaction-times, and an analysis of writing movements. The last-named experiments constitute a novel feature in a drill-course: like several other exercises, these reflect the author's personal interests and the trend of research work at Yale, but necessitate the use of rather elaborate apparatus. It may be doubted whether the average student will get much psychology from them.

The third group is designed to reveal the nature of certain important factors which condition all experimentation, viz., practise, distraction of attention, and fatigue, and, incidentally, to show how the experimental method may be applied successfully to the more general aspects of mental life. Practise is studied, first on the side of impression, by showing the importance of sensory control (reproduction of a drawing, target-practise, singing a given pitch), and secondly on the side of expression, by experiments with mirror-drawing, rapid tapping, and card-sorting. Tapping is also employed, in conjunction with other activities, simultaneously executed, to study the nature of distraction.

The last section gives directions for the study of memory after

Ebbinghaus' method, of the fluctuation of attention by the use of equivocal figures, retinal rivalry and Masson's disc,[1] of the range of attention, curiously by the complication experiment, tachistoscopy, etc., and of visual esthetic appreciation by exercises with the golden section and the balance of forms; it closes with a brief statement of Külpe's experimental study of the discrimination between subjective and objective visual experiences by the method of faint illumination.

In appraising these manuals, it must be said at the outset that they are bound to be of service in the advancement of experimental psychology; of how much service is another question. We now have available in English the simple exercises of Witmer in his *Analytical Psychology*, Seashore's recent *Elementary Experiments in Psychology*, Sanford's well-known *Course in Experimental Psychology*, Judd's two-volume *Manual*, and Titchener's exhaustive four-volume *Experimental Psychology*. These books vary in scope and general type of treatment: each has its sphere of usefulness. It will depend upon the instructor, the length of the course, the maturity of the student, and the laboratory equipment, just which one of them is employed. The expert instructor is likely to select his experiments, apparatus, and methods from several of these books, as his judgment dictates; the poorly trained instructor will, I suppose, follow as closely as he can the policy and precedent of the laboratory in which he himself worked.

Were the present writer conducting a laboratory course, he would find Judd's *Manual* useful mainly as an accessory treatise for consultation and for occasional suggestions as to variations of apparatus and method, though certain of the experiments in groups three and four might be selected for use: the remainder have been more extensively and more carefully treated elsewhere, notably, of course, in Titchener's *Manuals*. Incidentally, no one versed in modern experimental psychology can fail to note the almost studied manner in which Judd avoids reference to, or acknowledgment of, the service which these volumes are rendering in the development of the science.

It is Judd's policy, as we have noted, to discuss apparatus in a separate volume. The reviewer has been puzzled to know just whom this volume is to benefit. In the case of a young teacher who has had the benefit of the Yale training, it is to be assumed that general

[1] None of these methods affords an adequate and objectionless illustration of fluctuation: even Wundt, the most ardent champion of fluctuation, has referred the demonstration by equivocal perspective to peripheral factors; retinal rivalry gives merely an alternation of two supraliminal stimuli; while Masson's disc has been superseded by Ferree's arrangement.

familiarity with instrumentation and technique have already been acquired, and the volume on equipment would therefore serve merely for the refreshing of his memory. In the case of the teacher who has had no adequate training at Yale or elsewhere, one is tempted to say at the outset that he has no business teaching experimental psychology: but suppose, as sometimes occurs, this duty has been thrust upon him, as in a case which recently came to my notice in which an assistant in physics was appointed professor of experimental psychology in a normal school, and given $300 to start a laboratory, will Judd's book on equipment enable such a man to purchase and manipulate the requisite apparatus? My own opinion is that it will not. My point is that Judd would have done the struggling teachers of the science more benefit if he had prescribed a definite piece of apparatus for each experiment, and had carefully discussed the use of this piece, and shown wherein lie its difficulties.

Let me illustrate by reference to Exercise VII. This exercise prescribes for one period (it seems to me enough for two weeks' work), tonal fusions (13 combinations), fusions with variations in the intensity of the components (6 combinations), pitch discrimination (2 standard pitches), and mistunement of intervals (3 standard intervals): to these are added as investigations which 'should be undertaken,'— difference tones, counting beats, the pitch of noises, the highest and the lowest audible pitch. When, now, our poorly trained instructor consults his equipment book, he is told that the prescribed exercises *may* be done with Quincke's tubes, with a chromatic pitch pipe, with organ pipes, with the Appunn tonometer, the Stern variator, the sonometer, or with weighted tuning forks, including accessory resonators and tubes. Of the many pits and snares that confront the users of any one of these instruments or of their less obvious defects, little or nothing is said. Thus, the chromatic pitch-pipe which is mentioned for the production of tones of desired pitch (probably following the work of Gilbert) has an error of four or five vibrations. On the other hand, the series of simple discrimination forks, which Seashore has found so serviceable and which is perhaps the best simple apparatus for this test, is not mentioned at all.

Both of the volumes are freely illustrated, but many of the cuts are so reduced in size that the lettering cannot be deciphered, *e. g.*, Fig. 51 in Volume two. There are a few typographical errors, *e. g.*, 'one tone' for 'two tones,' Vol. III., p. 115, Bergströme for Bergström, p. 226 and eleswhere.

The dismissal of experiments in taste and smell with the bare

statement: "investigations of taste and smell have also been made. These senses are of so slight importance in human life that these investigations have more physiological importance than psychological" (p. 53) is rather startling, for smell embraces more sensory qualities than vision and audition combined; smell and taste have obvious functional significance, and their investigation is full of psychological interest.

GUY MONTROSE WHIPPLE.

CORNELL UNIVERSITY.

WITASEK'S PSYCHOLOGIE.

Grundlinien der Psychologie. STEPHAN WITASEK. Leipzig, Dürr, 1908. Pp. viii + 392. Mk. 3.

This book is well described in its preface as a 'kurze . . . dabei aber doch streng wissenschaftliche Gesammtdarstellung' of the present status of psychology. It is written from the well-defined standpoint of the Meinong school; and its greatest significance is that it strenuously upholds and carefully formulates the non-sensationalist theory of consciousness. Professor Witasek distinguishes between 'Psychologie des Geisteslebens' and 'Psychologie des Gemütslebens.' Under the latter head he gives fifty pages to the discussion of feelings and desires (*Gefühle* and *Begehrungen*) as against the two hundred odd devoted to sensational complexes (*Vorstellungen*) and thoughts. His important teaching that judgment, comparison, recognition and the like include unsensational factors is enforced by over-elaboration of detailed analyses which are often questionable.

A thoroughly helpful general distinction is that between the description and the explanation of the psychic fact. Witasek recognizes both the physical or physiological and the psychological explanation. In the opinion of the writer of this notice, he makes good his useful contention that the psychologist may discuss physical and physiological facts without espousing any one of the metaphysical theories of parallelist or of interactionist. (Cf. p. 103 *et al.*) Other significant teachings of the book are the following: the distinction (pp. 171 *seq.*, 187 *et al.*) between the sensational consciousness of space (*Raumempfindungen*) and the consciousness of space in general (*Raum überhaupt*); the distinction (p. 229) between the *Selbständigkeit*, or self-sufficiency, of sensations and the *Unselbständigkeit* of unsensational elements of consciousness; the teaching (p. 337) that there are no objectless emotions; the observation (p. 306) that abstraction is a form of attention.

In the opinion of the reviewer the book has one radical defect of

theory. While rightfully insisting that psychology is more than a study of psychic contents, or mere ideas, Professor Witasek refuses the true alternative to this theory, the conception of psychology as study of the self, or I. He discards the hypothesis for the conventional reason: because he supposes that by *Ich* must virtually be meant spiritual substance in the sense of Locke. Witasek concludes that a complex idea (*Vorstellung*) may possess all the characters claimed for the self; but he utterly fails to take account of the 'uniqueness' of every self, the character which would make me one self and you another even though my ideas were precisely similar to yours. He lightly sets aside also the appeal to introspection to verify the statement that every idea is the idea of some self, by arguing (p. 65[2]) that only a verbal necessity demands the admission that each idea implies a self. This argument is fraught with peril for Witasek's teaching, since the assumption of the essential correspondence between language and psychic fact lies at the basis of many of his characteristic doctrines. It should be added that at many points, and especially by his teaching about the psychic act and by his conception of judgment, Dr. Witasek seems, like so many psychologists, to imply the existence as basal fact of consciousness, of the self, or I, whom overtly he leaves out of account. (Cf. pp. 100, 231, 350[2].)

The present reviewer finds real difficulty also in Dr. Witasek's doctrine of the 'disposition.' Though he defines dispositions (p. 86), in agreement with Meinong, as cases of causal relation (*Kausalrelationsfälle*) he certainly does not avoid the danger of hypostatizing them, of treating them after the fashion of the old faculty psychologists (*e. g.*, on p. 313).

At several points, besides that already noticed, one may question the proportionate allotment of space to different topics. On the whole, there is a tendency to emphasize details about the physical stimulus at the expense of physiological fact and theory. Color-theories, for example, are inadequately treated: Müller and Franklin, to name no others, are not even mentioned. And though the copious references to recent experimental literature constitute one of the great advantages of the book, the very brevity of these references makes them sometimes almost futile and at other times misleading. In truth, one can refer only with tolerant amusement to the intense provincialism of Professor Witasek's bibliography. He cites two hundred and three titles — of which one hundred and seventy-nine refer to books and papers in German, fifteen to French writings, nine to English writings, and one to a Latin monograph by a German author.

Of the one hundred and nineteen authors to whom he refers, twelve are French, seven English, seven American and one Italian; but ten of the papers of these foreign authors are published in German. Witasek does not even avail himself of the support to be found in the work of contemporary American and English psychologists for the anti-sensationalistic conception of psychology.

The book as a whole may be recommended confidently to all who interest themselves in those theoretical discussions underlying any fruitful applications of psychology. It is written in rather unilluminated and involved style, but it repays study.

MARY WHITON CALKINS.

WELLESLEY COLLEGE.

PSYCHOPHYSICS.

Lehrbuch der psychologischen Methodik. ALFRED LEHMANN. Leipzig, O. R. Reisland, 1906. Pp. vi + 131.

The author proposes to give a manual of psychophysical measurement methods for the use of students with little or no mathematical training. Complicated demonstrations are avoided for this reason and the text of the book is confined to the description of the methods of calculation. The hypothesis of the Gaussian law is not made, because the author believes that we have to deal in most psychophysical problems with variable errors which cause asymmetrical distributions.

A quantitative psychological measurement is possible under either one of the following conditions. If a psychical state P depends on a physical condition R which admits of quantitative variation in such a way that P undergoes quantitative or qualitative variations if R varies, then it is possible to find a mathematical relation between these two phenomena and we call P a function of R. If, on the other hand, a psychical state P influences an external condition B in such a way that B assumes different values when P undergoes quantitative or qualitative variations, then we call B a function of P. The object of psychophysical experiments is to find series of the magnitudes P and R (or B), so that every element of one series is adjoined to a certain element of the other. These results must be subjected to a mathematical treatment in order to eliminate errors and to find, if possible, the nature of the function which exists between P and R or P and B. The scope of psychophysical measurement methods as defined by Lehmann is wider than that of the usual definition, in so far as it covers not only the measurement of sensation but also all the problems which admit of an exact treatment, as *e. g.*, the measurement of association and of memory.

The book consists of two parts, the first of which treats of the errors and their elimination, and the second of the methods of psychophysical measurement. The errors may be constant, accidental or variable. Constant errors may be eliminated by a proper arrangement of the experiments, if they are of the same magnitude and of opposite sign in two sets of experiments. The space error is an example of a constant error which may be eliminated in this way, whereas the time error has different sources so that in some cases it may be eliminated and in others not. Accidental errors follow the law of Gauss and may be eliminated by calculation. The chapter on variable errors is a short description of the method of interpolation by means of Newton's formula (the method of differences); the reader will find this chapter a handy and useful introduction to the use of Newton's method. This chapter is followed by some remarks on setting up an algebraic equation by the method of differences and on finding the most probable values of the constants of an equation by the method of least squares. The latter procedure is illustrated by an example on inhibition and reinforcement of sensations of pressure, which is taken from the author's 'Beiträge zur Psychodynamik der Gewichtsempfindungen.' Lehmann uses in his description of the method of least squares the term *condition equation* where the term *observation equation* ought to be used.

The second part of the book contains the description of the methods which serve for the measurement of association, of sensation, of inhibition and reinforcement, of reaction time and of energy. The presentation of the matter is clear and practical, and one finds a great number of useful hints as to the advantages of different ways of approaching a problem. Lehmann gives three methods for the measurement of sensation: the method of limits, the method of equal appearing differences and the method of constant stimuli, whereas Fechner's method of average error and the method of Lipps meet with an unfavorable judgment. The author describes three forms of the method of constant stimuli, only two of which were known before (Müller's method and the so-called abbreviated form of the method of constant stimuli). The third form, the complete method of constant differences as Lehmann calls it, consists in an interpolation and adjustment of the data. This method does not make any assumption about the law of distribution. The data of experiments on simple reaction time are treated by the method of the curves of distribution as suggested by Alechsieff and Bergemann, whereas the treatment of complex reactions is shown on some results of the late Dr. Buch. The chapter on

measurement of energy is very short and its topic is confined to Vogt's experiments and to Lehmann's ergographic experiments on inhibition.

F. M. URBAN.

UNIVERSITY OF PENNSYLVANIA.

ÆSTHETICS.

The Æsthetic Experience: Its Meaning in a Functional Psychology. A Dissertation. ELIZABETH KEMPER ADAMS. The University of Chicago Press, 1907.

Interest attaches to this monograph of Miss Adams' not only because of an increased interest in æsthetics in general but the rather because it represents the first attempt to extend the functional method of interpreting experience, as the several writers of the Chicago School interpret the term 'functional,' into what would appear, in the light of current discussion, its most difficult field. Miss Adams fully appreciates this fact and rightly concludes that the æsthetic experience is to be regarded as a sort of 'test case' of the functional position in general. Professor Angell has already pointed out that logic, ethics and æsthetics are but systematic developments of the problems that belong primarily to a functional psychology, or, conversely stated, a functional psychology, if not estopped, must issue in a logic, an ethics and an æsthetics. The sort of logic that results from the attempt to apply the functional method to the higher thought processes is to be seen in Professor Dewey's *Studies in Logical Theory*. Doubtless the same is true of Dewey and Tuft's *Ethics* which has just come from the press. In this monograph of Miss Adams' we are presented with the programme of 'pragmatism in æsthetics.'

Miss Adams' description of the functional position and method is faithfully done and there is no need of repeating it here. The real test and standard of any conscious experience, she says, reside not within itself but in the conduct to which it leads. Such description of conscious experience tends to break down the hard and fast distinction between psychology and the normative or valuational disciplines. All forms of consciousness whatever are possessed of meaning, of reference to something beyond, and the normative disciplines represent only the most conspicuous instances of such values. In short, consciousness is but the registration of values. But as evaluational, consciousness faces both ways, in other words, has both a backward and a forward reference. In every situation there is just so much of the past as is needed for the efficient control of the matter in hand. The reshaping and the resulting elimination and synthesizing of this ma-

terial drawn from the past proceed under the guidance of the emerging end. This end, at first bare, is enriched and defined through the intermediate survey and selection of past experiences. This end as object does not merely happen to be present but is there because it is the center of a cluster of specific activities. It is indeed a construction of those activities, never a mere external given. It marks a certain point in their interrelation and reorganization.

Thought arises only with the polarization of consciousness and subsides when means and end or ends are brought into some form of coalescence. Thus from immediacy to immediacy represents the whole of thought. It is wholly instrumental in character. It arises with the collapse of habitual control and finds its function in the transformation of the disturbed situation so that action can be resumed. Reflection, Miss Adams says, always arises as a method of dealing with some hitch in practice and is, in itself, activity of the most intense kind. As such it is to be set over against the action that follows upon the construction of this content.

Two kinds of conscious experience are therefore to be distinguished — immediate or constitutive and mediate or reflective. The latter bears a relation to conduct different from that of the former. By immediate or constitutive experience, Miss Adams means an experience that does not polarize itself, that is, a situation in which means and end follow close upon one another. We do the thing before we know it. There is no sense of effort. The experience is one of the happiest spontaneity and there goes with it the highly pleasurable sense of the putting-forth of energy. In a word, immediate experience is established coördination. The æsthetic experience, according to Miss Adams, is to be ranged on the side of immediate rather than reflective experience, and she finds the characteristics of the æsthetic experience in her analysis of what she calls the immediate or constitutive type of experience. She therefore reaches a definition of the æsthetic experience as a "certain type of concrete experience, having a high sense of immediate and specialized value inhering in a more or less definite object and possessing a strong and pleasantly colored 'feeling-tone.'"

The problem now arises as to the place of the æsthetic within the thought-process as thus described. According to Stuart, also of the Chicago School, the æsthetic is post-judgmental, while with Witasek it is pre-judgmental. According to Miss Adams the æsthetic arises as the culminating stage of the moment of reconstruction and is the mark of a successful issue. It appears, she says, toward the

close of intellectual reconstruction, is a sign that the reconstruction is complete, or at least sufficiently advanced for service as a guide to outward action and is of a pleasant emotional tone. Without some such type of experience it is difficult to see what would be the determining point for the cessation of reflection. As the 'pause of satisfaction' of Professor Royce, and one can add the 'perfect moment' of Miss Puffer, it denotes that means and end hitherto polarized have been once more consolidated, that the breach in experience has been healed and that conduct may go on modified and enriched through the intervention of thought. On a later page she says that the æsthetic experience marks the attainment of a more complete reality. In such a reconstructive experience, she continues, we have for the first stage what approaches a state of pure objectivity, the temporary disappearance of all definite objective reference with regard to the specific interest on hand. In the second stage we have the actual empirical self set over against the data that it is handling; and in the third stage we have the identification of the self with the new object and the blending of both self and object in the total reality. Here we have an approximation to the original undifferentiated continuum and to the original subjective and ejective stages. This last stage is the 'æsthetic moment.'

Moreover, the 'æsthetic moment' is the most entirely socialized moment in consciousness. The æsthetic experience rises in a social situation and in turn serves social ends. The reality of the æsthetic experience according to Miss Adams is essentially social in its implications and effects. It is only in connection with the social character of the æsthetic that the categories of objectivity and universality get more than a merely formal significance. This conclusion is in perfect agreement with that of Professor Tufts who holds that the æsthetic categories are to be sought for in social psychology. In the æsthetic experience, Miss Adams concludes, consciousness is not self-consciousness, and is social in the fullest psychological sense of the term. Art therefore is social in character and must necessarily perform a social function. Not art for art's sake, but art for society's sake, represents the outcome of the monograph.

But this conclusion subordinates the æsthetic experience to an experience of a practical character. Such procedure, however, is not new in the world of thought. The failure of current and past theories of the æsthetic experience is to be found in the common attempt to subordinate it to one or the other of the two recognized types of experience and thus place upon it the very limitations from which the æsthetic experience seeks always to disengage itself. To make art

social or practical in character means to *attach* to this unique type of experience the very motives from which it seeks to *detach* itself. Art must necessarily be common, that is, social in character, but the aspect of universality is found in the material employed, which is already universalized in thought, while the æsthetic experience as such represents the most complete and immediate personal appreciation.

One cannot but wish that the section entitled, 'Some Philosophic Implications of the Æsthetic Experience,' had been longer. For while summing up what has already been achieved, Miss Adams throws out some suggestions of a more satisfactory theory of the æsthetic experience. Here the ideal aspect of æsthetic experience is recognized in the statement that the new object in terms of which experience may be reintegrated is looked upon as if already constructed. Whether we call the new object a concept or an æsthetic construction depends wholly upon the point of view from which we regard it. The concept is essentially æsthetic. But the æsthetic moment has two functions. In addition to its being a sign of completed reconstruction and a signal for the resumption of action, it serves also as a sort of 'emotional deposit' which carried over becomes the basis of new experiences, mediate or immediate. Moreover, the æsthetic experience is now recognized as a distinct type of experience and set over against both the ethical and the logical. The last named types of interest represent experience in the making, that is, experience under active reconstruction. In both alike consciousness is divided, that is, dualistic; subject and object fall apart, while means and end are in state of perpetual conflict. Each involves the æsthetic, but both alike lack that detachment, that unmistakable glow of intellectual absorption and achievement in the satisfaction of moral victory which characterizes the æsthetic. The æsthetic does not attach itself to any one system or type of thought but is rather the basis and stimulus of many possible systems and types. In short, the æsthetic becomes a reservoir of experiences.

The reviewer is unable to harmonize the conclusions of the final part of the monograph with the preceding parts. In the earlier parts the æsthetic seems to be but a sort of accompaniment of unimpeded action, the index of established coördination, while in the last part it becomes the basis upon which all higher construction and interpretation proceed. To the reviewer the latter seem the more adequate interpretation of the nature and function of the æsthetic and is in essential agreement, as the author herself recognizes, with Professor Baldwin's 'æsthenomic idealism.'

W. D. FURRY.

JOHNS HOPKINS UNIVERSITY.

Psychologie und Aesthetik. THEODOR LIPPS. Archiv f. d. g. Psychologie, 1907, IX., 91–116.

The author discusses the question whether esthetics ceases to be a branch of psychology if it is admitted to be a *normative* science. He denies this. There is no fundamental difference between esthetic law (norm) and natural law (norm) except this, that the things which are governed by esthetic law are animate things, are conscious of the processes described in the law, whereas the things governed by natural law are unconscious. A science does not prescribe, but only describes the facts. The prescription of a norm belongs to 'reason,' with which neither psychology nor esthetics are identical, although both are sciences about reason. One may therefore regard esthetics as 'applied' psychology, applied to the comprehension of the facts embodied in the history of art.

MAX MEYER.

UNIVERSITY OF MISSOURI.

FEELING AND ATTENTION.

Lectures on the Elementary Psychology of Feeling and Attention. EDWARD BRADFORD TITCHENER. New York, Macmillan, 1908. Pp. vii + 404.

"The system of psychology rests upon a three-fold foundation: the doctrine of sensation and image, the elementary doctrine of feeling, and the doctrine of attention" (p. 3). In a most scholarly and able manner Professor Titchener treats of the last two. One must read the book itself to appreciate the openness and extent of the discussion. A brief review can only give a somewhat barren outline of the whole. After a brief treatment of the attributes of sensation Professor Titchener goes into a detailed explication of the characteristics of feeling and attention. After presenting a number of criteria by which a feeling may be judged the author gives the following: "Affections lack what all sensations possess, the attribute of clearness. Attention to a sensation means always that the sensation becomes clear; attention to an affection is impossible" (p. 69). The three-dimensional theory of Wundt is not upheld. Pleasantness and unpleasantness rather are the qualities of affection which can stand the test of scientific criticism and analysis.

As affection is characterized by lack of clearness, so sensation is marked by a difference in the levels of clearness which are present. Attention is the mental state of greatest clearness. The rest of the

field in such a case is obscure. Accommodation will facilitate this state of clearness. Less time is taken if there exists a predisposition towards a stimulus. As attention is focused more closely the field becomes more narrow till a maximum of from three to six objects are grasped in a single unity. Persistent attention is marked by a rhythm of fluctuation in which the field of clearness becomes subject to variation in the degree of clearness. A means of testing the strength of attention is by distraction. Attention is always present when feeling exists. "We may attend without feeling, but we cannot feel without attending. There is a fairly close parallel between the degree of clearness and the degree of pleasantness-unpleasantness" (p. 302).

No one will deny that the facts as presented with regard to attention and feeling are correct, but cannot Professor Titchener's words with reference to the motor aspect of attention be applied to his own interpretation of attention as sensory clearness? He says, "I have always regarded and I probably shall always regard, the motor interpretation of attention as one-sided" (p. 309). Sensory clearness as an aspect of attention will be readily granted, but is there nothing more to be found? Are there no other factors, as ideal reinforcement, motor control, etc.? Is not, in short, the whole process a sensorimotor, rather than a purely sensory one? Take, for example, the narrowing of the sensory field. Cannot this be considered as a quantitative change due to such processes? Cannot, too, the clearness of the situation be taken as a quantitative change in the situation due to ideal and motor processes? We cannot afford to neglect the experimental and scientific work of Münsterberg and Campbell (PSYCH. REV., Vol. I.), of Jastrow (*Am. J. of Psych.*, Vol. IV.), of Lindley (*Am J. of Psych.*, Vol. VII.), of Baldwin (*Ment. Dev.*), of W. McDougall, and others. The quantitative and the qualitative changes in the given field during attention are evident, but should this preëmpt the field to the exclusion of other processes equally prominent? Moreover, clearness in itself means nothing without the motor attitude which gives it meaning. The experiments of Binet, Barnes, etc., show the importance of motor attitudes and controls, and the genesis of meaning emphasizes similar elements (see Baldwin, *Gen. Logic*). It is a question, indeed, whether the motor attitude as developed by actual control on a previous occasion is not the factor which determines the degree of clearness which is possible, the extent of the totality which is apprehended, and the general limitations of the given field. Why, for example, should a knife and its handle form the center of a field of attention, if not because it has

been outlined by previous motor control, used as a totality, and applied by means of motor coördinations? If the motor aspect of attention is one-sided, and if, as I venture to suggest, the sensory aspect is equally one-sided, is not the sensorimotor view more correct?

The entire treatment of attention as sensory clearness as set forth by Professor Titchener, however, is the best which has appeared thus far. His unbiased discussion of the leading authorities and his interesting style render the book worth reading apart from its psychological value, while the list of authorities which is given makes the volume probably the best of its kind for the research student.

FELIX ARNOLD.

NEW YORK CITY.

EMOTION.

Les inclinations, leur rôle dans la psychologie des sentiments. G. REVAULT D'ALLONNES. Paris, Alcan, 1908. Pp. 228.

The main object of this work seems to be to establish a distinction between inclinations and emotions. Inclinations, emotions and passions, according to the author, are three species of *sentiments*. By an inclination he understands, extending the usual meaning of the word, any more or less complex and persistent system of psychological forces, or the active energy of such a system (pp. 24, 219). Inclinations include instincts, semi-instinctive dispositions and individually acquired habits and needs; they are classified as active, *i. e.*, motor, intellectual, *e. g.*, the preformed systems operative in perception, and emotional. The author is at pains to show that inclinations originally emotional may lose their affective character by habit, intellectualization and constitutional affective incapacity, and that psychologists have admitted the existence of affectively neutral states or elements of consciousness and of non-affective impulses and passions without recognizing the independence of inclination and emotion generally which he seeks to establish. Under emotions he distinguishes *émotions-chocs* and *émotions-inclinations*. The former alone, in his view, are emotions, in the strict sense; the latter, including what are commonly called emotions, are secondary formations in which sensori-motor and intellectual phenomena appear as superstructures on an emotional basis. Emotions proper, he holds, are all of visceral origin and, so far from being as indefinitely various as is commonly supposed, are reducible to three or four primary kinds, — surprise, pleasure, pain and *angoisse* (p. 57). As the first is thought to be neither pleasurable nor painful and possibly only a less intense

form of the last, the whole affective keyboard is reduced to three, named elsewhere (p. 214) *volupté*, *douleur* and *anxiété*. Among the more intense emotions the author includes (as varieties of pain?) hunger and thirst (p. 213). The third kind of *sentiment*, passion, is defined as 'a more or less complete unification of the individuality by an inclination,' in other words, not as a third kind, but as a species of inclination, a 'hypertrophied' inclination (p. 66) or '*inclination-fixe*' (p. 74). Passions, like inclinations generally, may exist without emotion, as, *e. g.*, *passions de tête* and passions of action.

Comparison of the 'peripheral' theory of emotion as variously expounded by James, Lange and Sergi, and Sollier's 'cerebral' theory, which is declared to be simply the peripheral theory with the substitution of more or less conjectural cerebral phenomena for ascertainable peripheral phenomena, leads to the conclusion that the immemediate physiological conditions of emotion are conscious organic reactions, that the emotional excitement sets up physiognomic, mimic and visceral phenomena and that the repercussion of these disturbances on the centers affects them emotionally. The author's criticism on the theory as presented by the writers mentioned is that it leaves undetermined the precise relation of the external sensori-motor phenomena to the internal visceral phenomena, and that it constantly confuses emotions and inclinations. He finds new light thrown on the problem especially by the experiments of Bechterew, who, by removing the cortex, with resulting atrophy of the pyramidal tracts, established the existence in frogs, guinea-pigs, cats, etc., of an automatic center for mimetic movements in the *thalamus* and portions of the *n. lenticularis* and *n. caudatus;* and by those of Sherrington who, after sections of the cord which completely isolated most of the body, and even the stomach, heart and lungs, from sensory connection with the brain, found his dogs exhibiting every sign of pleasure, fear, anger and disgust in practically undiminished intensity. Sherrington's experiments would upset the peripheral theory, if we could prove that the animals actually experienced the emotions whose signs they manifested; d'Allonnes, however, is convinced that they experienced no psychical emotion at all. He finds support for this belief in Becterew's demonstration that all the external signs of emotion may be produced automatically and, since the cortex was wanting, presumably, though not certainly, without consciousness. The possibility is open, therefore, that they may be excited from the brain acting on the automatic center without any emotional consciousness and merely as the expression of instincts and conscious habits. All the facts cited readily lend themselves to this interpretation.

This interpretation, however, can only be conjectural as far as the lower animals are concerned, for they cannot inform us concerning their experiences directly by speech. But it is put beyond question for our author, as far as man is concerned, by the case of a patient under his observation who, while exhibiting all the objective signs of chagrin, indignation, anger, fear, etc., always asserted, with evident sincerity, that she did not feel any of these emotions. The explanation of this emotional apathy is found by him in the patient's almost complete loss of affective, and in particular affective-visceral, sensibility. She is not 'generally anæsthetic'; indeed, her capacity for non-affective sensations is almost normal. But she is, or was at the time of the observation, almost entirely insensitive to pain, hunger, thirst, fatigue, etc., and such visceral sensations as she retained, while serving as signs to guide the life of habit, were devoid of either pleasure or distress. This loss or lowering of affective organic sensibility is held to account also for the patient's defective appreciation of the passage of time, giving rise to the theory that the consciousness of relatively short intervals, as distinguished, on the one hand, from perception of the passing present and, on the other, from conceptual constructions of time, is due to the 'progressive fusion of organic emotions' (p. 171).

The conclusion which the author draws for the theory of emotion is that emotion is due fundamentally to visceral sensations, that visceral phenomena are alone affective and that the so-called expressions of emotion, the play of the muscles of relation, are in themselves not emotional at all. Yet he admits that the latter may modify the affective *timbre* of the internal sensations and, under normal conditions, support them (p. 210). The further conclusion is drawn that inclinations, *i. e.*, psycho-physiological systems, may exist and operate without emotion, though they themselves may even appear as the residua of past emotions, as in the case of the author's patient who illustrates the 'inclinations' of fear, desire and duty without any feeling of their thrill. Finally two laws are formulated which express the process by which psychological systems germinate and decay: they may disappear without involving the disappearance of the derived phenomenon or system; or they may divide and give place to mutually independent systems.

The theory of emotion thus outlined naturally suggests the following criticism. The evidence for it is derived entirely from observation of a single pathological case; everything, therefore, depends on the accuracy of the observation and on the skill with which the facts are interpreted. The facts taken at their face value are briefly these: a

patient (1) manifests all the symptoms of certain emotions on the usual occasions of their appearance without actually experiencing them; these symptoms include changes in respiratory and cardiac movements, as well as tears, sobs, alterations of voice and similar obvious expressions (p. 175); she (2) is generally incapable of any strong emotion: what should and once did move her does not now, as she says, 'touch' her; she (3) is either incapable of, or markedly defective in, the experience of certain organic sensations normally of strongly affective quality, such as hunger, thirst, pain, fatigue and nausea. From (1) it is concluded that the external expressions contribute nothing to the constitution of an emotion, and from (2) and (3) that an emotion consists solely in visceral sensations. Now clearly, to begin with, no basis for this distinction is afforded by the view that the external expressions are instinctive, or, as the author says, phenomena of inclination. It is of the essence of James's theory to regard them as such. They may conceivably all be produced by stimulation of the appropriate automatic centers without participation of the cortex or of consciousness. The question, as related to the James theory, is, were they felt, and particularly were the respiratory and circulatory changes felt, in normal intensity as they occurred? Unfortunately on this point the record is silent. Granting that we are right in assuming that they were, it is evident that in this particular case the sensations were insufficient to constitute an emotion. But it does not follow that they contribute nothing to its constitution in normal cases, where they are combined in one stirring pulse of consciousness with a multitude of other sensations flowing in from all parts of the body and with the various feelings of conflict and tension arising from the incoördination of activities. Indeed, the author himself practically admits this when he allows that they may normally affect the *timbre* of the emotion, for the *timbre* of an emotion is clearly an integral, even if a subordinate, part of the whole complex emotional 'affect.' Nor is the theory any better established on its positive side. In earlier reports of the case the author had spoken of the patient's complete visceral anæsthesia, and he still assures us (p. 136) that her 'somatic sensations' are 'abolished.' A German critic doubted the completeness of the anæsthesia. In reply it is explained that it it only the 'affective tonality, the *Gefühlston*' which is lost, the sensorial, cognitive quality of each sensation being retained. The *Gefühlston* is interpreted, by a strange perversion of its usual meaning, as consisting in a 'gamut of affective, viscero-cerebral sensations: pain, bodily pleasure (*volupté*), hunger, thirst, disgust (or nausea, *dégoût*), *angoisse*, etc.' (p. 186 f.). Now these are the sensa-

tions which, it will be remembered, the author either defines as emotions 'in the strict sense' or declares to be emotions of peculiar intensity. The doctrine, then, that emotions consist in these sensations is purely verbal and nothing is gained for it by exhibiting a patient who is without them. What was wanted was evidence to establish the view that these sensations, severally or combined, constitute, along with other elements demonstrably non-affective, the feeling of, say, love or fear. But of this we have not a trace; all that we have, besides a definition in which the question is virtually begged, is a simple collocation of two facts, the absence of certain organic sensations and the absence of strong emotions. It never seems to occur to the author to ask whether this concomitance may not be due to a common cause, *e. g.*, some sort of central inhibition. It would have been more to the point had a case been presented of the reverse type, one namely in which the patient was completely anæsthetic as regards all the external expressions of an emotion while retaining full sensorial consciousness of the internal changes. If such a patient declared that she experienced the emotion with the same intensity as before the anæsthesia, something could indeed be said for connecting the feeling with the internal bodily changes alone. But even so the evidence would be inconclusive as regards the constitution of the emotion apart from the introspective analysis which is the strength of James's theory, but of which in this modification of it nothing is made at all.

As to the author's doctrine of inclination, it is clearly subordinate to his doctrine of emotion, and the only remark that it perhaps calls for here is that while it seems desirable to think of the more or less durable dynamic formations that determine the life of consciousness under a common term, the term 'inclination' hardly appears the one best suited to the purpose. 'Psycho-physical disposition' is doubtless more cumbrous, but it is at any rate freer from objectionable associations.

H. N. Gardiner.

Smith College.

TOUCH AND MUSCLE SENSE.

Le toucher et le sens musculaire. Van Biervliet. Année Psychol., 1907, XIII., 114–121.

This article describes some preliminary experiments and conclusions in a general study of the extent and character of the relation between muscular movement and the tactual sense. Starting from the general conclusions of Vierordt, which the author wrongly attributes

to Weber, that the sense of touch of an organ is finer the greater the natural mobility of that organ, Van Biervliet conducted a series of experiments to show a more intimate relation between mobility and keenness of touch. The first experiments comprised a study of the tactual sense of the forehead in twenty individuals who moved this part in a greater or less degree. The subjects were arranged in groups according to the mobility of the forehead. The relative mobility of the forehead was determined by observing its movements during conversation and by counting the number of wrinkles found in it. Æsthesiometer tests were used and the forehead was compared with the tactual sense of the back of the most used hand. The subjects were men of intellectual pursuits who had not trained their hands to any great degree of dexterity in special manual work or in music. The results showed a fraction of $\frac{99}{100}$ for group 1 — that is, for those having the least movable forehead. The coefficient decreases gradually to $\frac{25}{100}$ in group 10 — those having the most movable forehead.

That the relative sensibility of the forehead increases regularly with the greater mobility of the frontal muscles would seem to indicate that the fineness of the tactual sense corresponds not only to the natural mobility of the organ, but to the mobility acquired through exercise. The mobility of a part, therefore, seems to be in some way a 'determining cause and an essential condition' of the sense of touch.

In order to determine if possible how these movements aided the judgment of distance on the skin, æsthesiometer measurements were taken for three regions: the back of the most used hand, the anterior surface of the upper forearm two centimeters above the bend in the elbow, and the forehead. The results show clearly that adding movements increase the fineness of the sense of touch of the organ explored. In the forehead, for example, the sensitiveness for simultaneous contact was 7, for successive contacts 4 and when the subject moved his head 2.

The author concludes that no part is absolutely immovable when being explored. The hand affords an excellent example of this. It is more movable than the arm and perceives more points of contact when apparently unmoved, and when allowed to move it becomes more sensible to points of contact. Furthermore, changes in muscular tension are often observed in the organ explored. All these facts, the author believes, indicate a very vital connection between the tactual and the muscle sense.

ROBERT D. WILLIAMS.

YALE UNIVERSITY.

REPORTS AND DISCUSSION.

THE NEW PSYCHOLOGY BUILDING AT THE UNIVERSITY OF CHICAGO.

With the beginning of the present academic year the department of psychology in the University of Chicago takes up its abode in new and commodious quarters, a brief account of which may be of interest to readers of this journal.

The department has been given for its exclusive occupancy a three story and basement stone-and-brick building with a ground plan of sixty by forty feet. This affords upwards of nine thousand square feet of available floor space.

The north half of the basement (60 x 20 feet) is devoted to a draughting room and shop. The shop will be on a distinctly larger scale than heretofore and after the present year will undertake, under the joint direction of Professor C. H. Judd and the writer, to manufacture psychological apparatus for other laboratories as well as materials for our own use. The south half of the basement is fitted up as a dark-room. Among other devices this room is supplied with a heliostat and an arc light. Either sunlight or artificial light is thus available for color work.

On the ground floor are two large lecture rooms supplied with dark curtains and projection lanterns. The lecture desks, ten feet in length, are fitted with electricity for light and power, with gas and air pressure, while water is immediately at hand. The remainder of the space on this floor is given over in part to rooms reserved for work in the training courses, *e. g.*, a suite for acoustical work, a room for the study of cutaneous sensations, and so forth. The rooms not thus accounted for are used for the storage, repair and care of apparatus.

On the second floor is the department library and a large seminar room for the exclusive use of advanced graduate students. Here each may have his own desk room, lock-drawers for papers, etc. On this floor also are the department offices and a number of additional rooms for work in the training courses; for example, a specially prepared room for work on smell and taste, and a suite for experiments in vision.

The top floor is entirely reserved for research purposes. Fourteen rooms are available, the average size being about twelve feet square. Half of these have sunlight all day, while three have only north light and the other four get the sun at the ends of the day. A small photo-

graphic dark-room supplements the large plant in the basement. All of these rooms are high above the noise and dirt of the street. A dumb-waiter at the rear of the building permits the easy carrying of heavy apparatus up and down from one floor to another.

The electrical arrangements differ somewhat from those installed in other psychological laboratories and promise great convenience and efficiency. Every room has electric lights and plugs from which a direct current can be drawn. Gas is also available in a number of places, although it is not intended for illuminating purposes. Arc lights are supplied to the basement dark-room and to the lecture room lanterns. Electric power adequate for running the lathes and other machines is supplied to the shop. A storage battery of twelve large units is by appropriate connections made available for use anywhere in the building, delivering any amount of current desired up to the limit of its capacity. A circuit for high amperage motors supplies all the rooms where such apparatus may be required. The fourteen research rooms are joined to one another by six circuits so arranged that by a system of plugging one or more circuits may be made to unite any room in the series with any other. Any room may also be connected with the floors below. The system thus permits the maximum of flexibility in conducting experiments where observer and experimenter require to occupy separate and isolated rooms.

A series of speaking tubes unites distant parts of the building with one another, *e. g.*, the shop with the research rooms and with the director's office. Hot and cold water are supplied on every floor, as well as wash-rooms and sinks for cleansing apparatus. Air pressure is also available at a number of points.

The building formerly used as a laboratory, together with the adjacent yard, will be employed hereafter solely for the work in animal psychology. This will obviate the difficulties, hitherto so serious, of keeping animals in a building used for general academic purposes.

With two entire buildings at its disposal the work of the department can be carried on with a degree of convenience and efficiency previously impossible.

JAMES R. ANGELL.

UNIVERSITY OF CHICAGO.

'MAGNETIC SENSE' OF DIRECTION.

So far as I know there has been no scientific investigation of the possible presence of a sense of north-south direction in man. There are some allusions to such a sense in fiction (see du Maurier's *Martian*) and it appears to be a somewhat popular belief.

A friend of mine recently informed me that his son, T. D., aged 5, is able at all times to tell direction. My friend's attention was called to this during a summer trip by the boy's remarking that the street on which they lived at home ran a certain way, which he indicated. As a matter of fact the street runs nearly due north and south. Finding by compass that the boy was right, he has since tested him from time to time in various places, at night, blindfolded, etc., with uniformly correct results. I had an opportunity to test the boy several times with a compass, walking him around blindfolded each time before the test, so that he should lose all direct notion of present orientation. All the results were correct to within a few degrees. When the question is put to him, he motions with his hand in the right direction instantly and without hesitation or taking observations. He also distinguishes correctly north (the direction of the railroad station at home) from south. On account of the boy's bashfulness I was unable to prolong the tests or vary them sufficiently for scientific accuracy. They led me, however, from an absolutely skeptical attitude to one of inquiry.

The problem is offered to those interested in child study as a matter worthy of investigation. If such a sense has been developed in the phylogenetic scale (as suggested by the migration of birds) it may still appear in a rudimentary form in man, and distinct traces may be discovered in childhood which are lost later on in life.

H. C. W.

BILLIONS OR TRILLIONS. — A NOTE OF CORRECTION.

In my review of Raymond's *Essentials of Æsthetics* (this journal, Vol. IV., no. 7, p. 255 ff.) I took occasion to criticize that author for speaking of the vibration rate of light waves as *trillions* instead of using the, to me, more familiar term *billions*. I have just been made aware of the error of this stricture. In comparing the current edition of a standard text-book in psychology with an earlier edition of the same work, I found that in the earlier edition the rates were given as 'billions,' and in the new edition as 'trillions.' This attracted my attention again to the matter, with the result that I discovered the difference in usage as practiced, on the one hand, by English and German writers who term a *million million* a *billion*, and, on the other hand, by American writers who term the same a *trillion*. Besides offering a tardy correction to my review, this note may, perhaps, serve to enlighten some others on this rather confusing variance in usage.

ROBERT MORRIS OGDEN.

UNIVERSITY OF TENNESSEE.

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National Idealism and the Book of Common Prayer. An Essay in Re-interpretation and Revision. STANTON COIT. London, Williams & Norgate, 1908. Pp. xxv + 467. 10/6 net.

Questions in General and Educational Psychology. GUY MONTROSE WHIPPLE. Cornell Study Bulletins for Teachers, No. 3. Syracuse, C. W. Bardeen, 1908. Pp. 108.

Race Questions and other American Problems. J. ROYCE. New York, Macmillans, 1908. Pp. xv + 287.

Psycho-physiologie de la Deuleur. I. IOTEYKO and M. STEFANOWSKA. Paris, Alcan, 1909 (for 1908). Pp. 251.

La Morale naturelle. J. L. DE LANESSAN. Paris, Alcan, 1908. Pp. 412. 7 fr. 50.

NOTES AND NEWS.

THE seventeenth annual meeting of the American Psychological Association will be held in Baltimore during Convocation Week, in conjunction with meetings of the American Philosophical Association, the American Association, and other societies. The sessions of the Association will be held on Tuesday, Wednesday, and Thursday, December 29–31. It is probable that a joint session will be arranged with the Section of Education of the A. A. A. S. All titles of papers should be sent to the Secretary not later than December 15.

THE fourth annual meeting of the Southern Society for Philosophy and Psychology will be held in Baltimore during the same week, the exact dates to be announced later. The Secretary should be informed as early as possible of the titles of papers or reports to be offered.

MR. L. W. COLE, recently professor of philosophy and psychology at the University of Oklahoma, has been appointed instructor in experimental psychology at Wellesley College. Professors Hugo Münsterberg and George Santayana, of Harvard University, will lecture on æsthetics at Wellesley College during the coming year.

DR. DANIEL STARCH, instructor in experimental psychology at Wellesley College, has been appointed instructor in psychology in the University of Wisconsin.

DR. CLARENCE VANEPPS has been appointed lecturer in mental pathology in the department of philosophy and pathology of the State University of Iowa.

OUR attention has been called to the erroneous impression conveyed in a notice of G. Bohn's article on the acquisition of habits by animals (*Année psychologique*, XIII., 170) published on page 238 of the BULLETIN. The article in question is a summary of work by other investigators, not of the author's original results, as would appear from the review.

THE following are taken from the press:

AT the recent third International Congress of Philosophy, held at Heidelberg, it was decided that the fourth Congress will take place in 1912 at Bologna.

AT the University of Michigan DeWitt H. Parker, Ph.D. (Harvard), has been appointed instructor in philosophy, and F. C. Dockery, A.B. (Mich.), and Elmer C. Adams, A.B. (Mich.), assistants in psychology.

PROFESSOR WILLIAM JAMES returned on October 16 from England. He has been lecturing at Oxford on 'The Present Position of Philosophy,' and it is announced that these lectures will be repeated at Harvard University.

PROFESSOR GEORGE T. LADD is giving a course of fifteen lectures on certain psychological aspects of education at the College for Women of Western Reserve University.

MR. F. C. BECKER, assistant in philosophy in Columbia University, has been appointed instructor in philosophy in the University of Illinois.

DR. JESSE H. WHITE, Ph.D. (Clark), has charge of the work in psychology and education in Pittsburgh University during the absence of Professor Edmund B. Huey, who is spending the year in Paris.

PROFESSOR M. STUART MACDONALD, of the University of Fredericton, will give assistance to the department of philosophy at McGill University pending the appointment of a successor to Professor Taylor